UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/AC.218/1992/6
7 January 1992

ORIGINAL: ENGLISH

COMMITTEE ON THE DEVELOPMENT AND UTILIZATION
OF NEW AND RENEWABLE SOURCES OF ENERGY
Sixth session
3-14 February 1992
Item 3 of the provisional agenda*

IMPLEMENTATION OF THE NAIROBI PROGRAMME OF ACTION FOR THE DEVELOPMENT AND UTILIZATION OF NEW AND RENEWABLE SOURCES OF ENERGY

Activities being carried out by the entities within the United Nations system in the field of new and renewable sources of energy

Report of the Secretary-General

SUMMARY

This report presents an overview of the activities being carried out by the entities of the United Nations system in the field of new and renewable sources of energy. An analysis of the involvement of those entities reveals clusters of organizations in certain of the priority areas outlined in the Nairobi Programme of Action. A similar cluster pattern is also revealed with respect to the various sources of energy.

The United Nations system has undertaken wide-ranging activities for assisting the developing countries to incorporate new and renewable sources of energy into their national energy mix. Substantial progress has been made in many developing countries. Progress has also been achieved in understanding the technical feasibility of the new and renewable energy technologies.

* A/AC.218/1992/1.

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INTRODUCTION

1. At its fifth session, from 26 March to 4 April 1990, the Committee on the Development and Utilization of New and Renewable Sources of Energy concluded that the implementation of the Nairobi Programme of Action for the Development and Utilization of New and Renewable Sources of Energy required sustained and continuous efforts by the United Nations system, through the preparation and execution of concrete programmes and projects, in accordance with national plans and priorities. In view of the Committee's responsibility of monitoring the implementation of the Nairobi Programme of Action, the Committee requested the Secretary-General to submit a report on the activities being carried out by the entities within the system in the field of new and renewable sources of energy, for consideration at its sixth session. 1/ This report has been prepared in response to that request. It presents an overview of the activities and an analysis of trends.

2. The report is based on information provided by the entities within the United Nations system. The information made available varied in the extent of its coverage from very brief to very detailed. It did not, however, cover the extent of implementation of the programmes, plans for future activities or activities in the pipeline. It was supplemented, where necessary, with information in the database maintained by the New and Renewable Sources of Energy Section, Energy and Resources Branch, Department of International Economic and Social Affairs.

I. PROJECTS AND PROGRAMMES

3. The Nairobi Programme of Action called for the development and utilization of new and renewable sources of energy, especially in the developing countries, and identified broad policy areas for concerted action: energy assessment and planning; research, development and demonstration; transfer, adaptation and application of mature technologies; information flows; education and training; and rural energy development. Within the policy areas, the following sources of new and renewable sources of energy were emphasized for development: solar, wind, biomass, fuelwood and charcoal, hydro, geothermal, draught animal power, ocean energy, tar sands and oil shale, peat. 2/

4. Table 1 shows the activities undertaken with respect to the above-mentioned policy areas by the entities within the United Nations system in the implementation of the Programme of Action. While the activities were of various types, they have been broadly classified under the categories of supporting measures and technology/resource transfers. Supporting measures include, in addition to an assessment of new and renewable sources of energy resources, such activities as information exchange, reports and publications, workshops, seminars, symposia etc. Technology transfer is effected under technical cooperation projects, and resource transfers are in the form of financial assistance and grants at the pre-investment and investment levels.

Table 1. Activities of the United Nations system in the implementation of the Nairobi Programme of Action

Nature of activities and entities of the United Nations involved / Priorities of the Nairobi Programme of Action	Supporting measures		Technology/resource transfer	
	Information exchange, studies, publications, reports to intergovernmental meetings	Meetings, symposiums, experts groups, seminars, workshops	Technical cooperation projects/ activities	Financial assistance/ grants
Energy assessment planning	DIESA, DTCD, ECA, ECE, ECLAC, ESCAP, ESCWA, FAO, IBRD, UNESCO, UNEP, UNIDO, UNITAR, UNU, WMO	DIESA, DTCD, ECA, ECE, ESCAP, ESCWA, FAO, INSTRAW, UNDP, UNESCO, UNIDO, UNITAR, UNU, WMO	DTCD, ECE, ESCAP, ESCWA, FAO, ILO, UNIDO, UNDP	UNDP, IBRD, IDA
Research, development and demonstration	DTCD, ECA, ECE, ECLAC, ESCAP, ESCWA, FAO, UNIDO, UNU	DTCD, ECA, ECE, ESCAP, ESCWA, FAO, UNIDO, UNU	DTCD, ECE, ESCAP, ESCWA, FAO, UNICEF, WHO	UNDP
Transfer, adaptation and application of mature technologies	DTCD, ECA, ECE, ECLAC, ESCWA, FAO, UNIDO, UNU, UNICEF, WHO	DTCD, ECE, ECA, ECLAC, ESCAP, ESCWA, FAO, UNIDO, UNU, UNICEF, WHO	DTCD, ECE, ESCAP, ESCWA, FAO, UNIDO, UNU, UNICEF, WHO	UNDP, IBRD, IDA
Information flows	DIESA, DTCD, ECE, ESCAP, FAO, UNESCO, UNU	DTCD, ECE, ESCAP, FAO, UNESCO, UNU	DTCD, ECE, ESCAP, FAO, UNESCO	UNDP
Education and training	DIESA, DTCD, ECA, ECE, ESCAP, ESCWA, FAO, UNESCO, UNIDO, UNU	DTCD, ECE, ESCAP, ESCWA, FAO, UNESCO, UNIDO, UNU	DTCD, ECE, ESCAP, FAO, UNESCO	UNDP
Rural energy development	DTCD, ECA, ESCAP, ESCWA, FAO, UNU	DTCD, ECA, ESCAP, FAO	DTCD, ESCAP, FAO	UNDP, IFAD

Source: Reports from the entities of the United Nations system.

Note: For a list of abbreviations, see annex.

5. As table 1 shows, the involvement of the entities of the United Nations system occurs in clusters, with a higher concentration in the category of supporting measures. This is largely due to mandates, the nature of their activities and the financial and human resource constraints of the organizations involved.

6. Within the supporting measures category, further clustering is observed. For instance, relatively more activities have been carried out in energy assessment and planning and in education and training; this may reflect the availability of resources within the organizations, which essentially influences the nature of activities that can be carried out.

7. Few organizations are involved in the technology/resource transfer category, in large part owing to the type and amount of resources required. Organizations active under this category are mainly agencies with financial resources for development assistance. Other organizations have been able to contribute through extrabudgetary arrangements.

A. Activities in the implementation of the Nairobi Programme of Action

8. In implementation of the Nairobi Programme of Action, the entities within the United Nations system have undertaken a wide range of activities. Substantial progress has been achieved in providing assistance to the developing countries in the assessment of new and renewable sources of energy resources and in the evaluation of the technical feasibility of associated technologies. Although a large number of the activities are of a supporting nature, substantial contributions continue to be provided by a number of organizations in the transfer of technology, through technical cooperation projects and activities.

9. The Department of International Economic and Social Affairs continues to monitor progress made in the implementation of the Programme of Action and provides substantive support to the Committee on the Development and Utilization of New and Renewable Sources of Energy. It also provides support to the Administrative Committee on Coordination (ACC) Inter-agency Group on New and Renewable Sources of Energy, charged with the task of coordinating relevant activities within the United Nations system. The Department analyses global trends and prospects of new and renewable sources of energy and prepares integrated reports on the activities and programmes of United Nations bodies, other intergovernmental and non-governmental and public and private-sector national organizations. It also prepares technical reports on various types of new and renewable sources of energy and collects, processes and disseminates, world wide, through the network of focal points (national and within the United Nations system) information on activities in the field of new and renewable sources of energy. It maintains a database and regularly produces a compendium of such activities.

10. The Department of Technical Cooperation for Development provides the services of interregional and technical advisers to developing countries requesting them. Advisory services continue to be provided on exploration and development of geothermal reserves, hydropower, solar, wind and biomass energy. Such services are also continuing on energy planning and information systems, development of national energy policy and conservation programmes, strengthening of energy-related institutions and legislation, promotion of modern energy technologies, and rehabilitation and upgrading of electric power networks. The Department also organizes broad-spectrum training courses, seminars and workshops for managers, engineers and technicians.

11. The Economic and Social Commission for Asia and the Pacific (ESCAP), in addition to regular budget activities, implements new and renewable sources of energy activities funded by the United Nations Development Programmme (UNDP), such as the Regional Energy Development Programme for the Asian subregion, the Pacific Energy Development Programme, and a regional network on biomass, solar and wind energy. Technical assistance projects in new and renewable sources of energy, including rural energy planning, have been implemented through information support, consultancy services, training programmes, workshops, seminars and expert group meetings. In the implementation of these projects, technical cooperation among developing countries has been emphasized.

12. New and renewable sources of energy applications have been ranked in terms of priority for development and use by the member countries of ESCAP. The priority rankings and the respective priority levels are shown in table 2. A regional priority project package has been developed through consultation with the countries of the region. However, several of the projects in the package - resource assessments, biomass conversion for rural energy supplies and solar thermal systems - have not been implemented due to lack of financing. Rural energy planning studies have been conducted in a number of countries in the region. Assistance is being provided for demonstration and training facilities in solar photovoltaic technology, and network arrangements are being pursued with other organizations in this field.

13. The Economic Commission for Africa (ECA) prepares reports and analyses on the development of new and renewable sources of energy in the regional countries and provides advisory services. More consideration has in recent years been given to the utilization of solar energy, wind power, biomass conversion, ocean energy and the efficient use of energy in rural and remote areas.

14. The Economic Commission for Europe (ECE) has been very active in the development and utilization of new and renewable sources of energy in its member countries. Several of its activities have progressed beyond the development stage to the application and adaptation of mature technologies. The high level of activity is being maintained with numerous new projects.

Table 2. Priority rankings of new and renewable sources of energy applications by the countries of the ESCAP region

Priority ranking	Applications	Total of rankings by individual countries			Priority level
		High	Medium	Low	
1	Solar photovoltaic technology	16	1	-	H
2	New and renewable sources of energy planning and management	14	3	-	H
3	Rural energy planning and management	14	2	1	H
4	Forestry for fuel	10	4	3	H
5	Solar thermal energy for heating	9	6	2	H
6	Small hydro power	9	2	6	H
7	Wind water pumping systems	8	7	2	H
8	Solar crop drying and cooling	8	6	3	H
9	Biogas plants for small-holders	8	4	5	H
10	Agricultural residues, utilization of	7	7	3	H
10	Solar refrigeration	7	7	3	H
11	Efficient cooking stoves	6	9	2	H
12	Wind electricity systems	5	7	5	M
13	Biomass gasifier technology	5	6	6	M
14	Biogas plants based on industrial effluents	5	4	7	M
15	Solar cookers	4	9	4	M
16	Solar air-conditioning	4	8	5	M
17	Biogas plants for institutional and community use	4	7	6	M
18	Briquetting, densification and carbonization	4	6	7	M
19	Biomass thermal power plant	4	4	9	L
20	Fuel alcohol	3	9	5	L
20	Solar thermal electrical systems	3	9	5	L
21	Geothermal energy	3	3	11	L
22	Peat	1	2	14	L

Table 2 (continued)

Priority ranking	Applications	Total of rankings by individual countries			Priority level
		High	Medium	Low	
23	Tidal power	-	8	9	L
24	Vegetable oil as fuels	-	7	10	L
25	Wave energy	-	5	12	L
26	Ocean thermal power	-	4	13	L

Source: Third meeting of ESCAP focal points on new and renewable sources of energy, September 1988, Bangkok.

15. The Economic and Social Commission for Western Asia (ESCWA) has conducted studies to identify specific areas for application of new and renewable sources of energy in the region, including the establishment of solar and wind energy measuring networks, solar and wind pumping in remote areas, and solar and wind energy for desalination of brackish and sea water.

16. Reports and studies on new and renewable sources of energy by the Economic Commission for Latin America and the Caribbean (ECLAC) have included evaluations of the possibility of substituting local sources of energy, such as geothermal, hydroelectricity and firewood, for imported petroleum products.

17. In providing assistance to its member countries in the implementation of the Nairobi Programme of Action, while taking the lead in identifying needs and problems and promoting appropriate action related to energy for rural development, the programmes of the Food and Agriculture Organization of the United Nations (FAO) have emphasized the development and promotion of new and renewable sources of energy adapted to the socio-economic needs of rural populations in the developing countries. FAO programmes also include a networking of national institutions, particularly through technical cooperation among developing countries. Its activities in the area of energy assessment and planning focus on developing an integrated approach by incorporating energy into rural and agricultural planning and on assistance to countries in establishing a framework for activities in this field. FAO also promotes the use of mature and promising technologies and carries out programmes and projects at various levels - global, interregional, regional and country - concentrating on priority areas identified by its governing body - for example, energy assessment and planning for rural and agricultural development, fuelwood and charcoal, biomass, draught animal power, solar energy, wind energy and people's participation in energy programmes for rural areas, with special reference to women.

18. In conformity with its mandate for information dissemination and its experience in the field, the energy programme of the United Nations Educational, Scientific and Cultural Organization (UNESCO) is designed to stimulate research in and evaluation of global energy programmes and to develop training and information programmes to sensitize both specialists and the general public to the possible utilization of new and renewable sources of energy and energy conservation. UNESCO activities in the field of energy focus on the development of training and information services in new and renewable sources of energy, energy conservation and global aspects of energy policy, especially with regard to environmental considerations, and the establishment of an international forum to review and evaluate the impacts of energy use. One of the main achievements of the information programme was the establishment of an energy knowledge bank on new and renewable sources of energy and energy conservation. A networking programme, launched by UNESCO, led to the establishment of several regional networks on renewable energy information (Africa, Caribbean, Latin America, and Asia and the Pacific), which are being continually developed and consolidated. UNESCO's training scheme involves several types of programmes: the Energy Training Programme, the Summer School on Solar Electricity for Rural and Remote Areas, and the Study Grant Programme. UNESCO also publishes the International Journal of Global Energy Issues.

19. One of the main activities of the United Nations Institute for Training and Research (UNITAR) in the field of new and renewable sources of energy has been the UNITAR/UNDP Centre on Small Energy Resources, located in Rome. The Centre publishes a newsletter four times a year and has conducted a number of workshops, including the first international conference on small geothermal resources, and an expert meeting on energy for rural Africa. After the workshops and seminars, the Centre published technical guidelines - for example, on geothermal energy development and on drilling and the testing of geothermal fluids. A guidebook for policy planners, "Photovoltaic resources: application, utilization and assessment", was published. UNITAR also organizes the triennial International Conference on Heavy Crude and Tar Sands; the fifth conference was held in Caracas in August 1991.

20. The activities of the United Nations Industrial Development Organization (UNIDO) in new and renewable sources of energy are directed towards energy-related aspects of industrialization, such as energy conservation and energy management. Support is provided in the areas of transfer and application of technology, strengthening of institutional infrastructures for the development of new and renewable sources of energy, identification of financial resources, training of technical and managerial personnel, and establishment of appropriate legislative and regulatory frameworks. Requests from developing countries for UNIDO's technical assistance in the field of new and renewable sources of energy are mainly in biomass, hydropower, solar and wind-related energy systems.

21. The World Meteorological Organization (WMO), while providing overall coordination for the World Climate Programme, has been carrying out activities on climate application to the energy sector, including compatible

climatological databases for use in energy planning and operations, as exemplified by the regional project "Meteorological information for the development of renewable energy", financed by UNDP. Solar and wind energy continue to be given priority. With UNDP assistance, WMO is helping eastern and southern European countries in a two-year pilot project on the use of their climatological information for the assessment of wind and solar energy potential. Since the adoption of the Nairobi Programme of Action, WMO has conducted eight workshops of one-week duration on the presentation and use of meteorological information for solar and wind energy resource assessment, and many advisory missions.

22. The activities of the United Nations Centre for Human Settlements (UNCHS) have included several publications on the use of new and renewable sources of energy, with emphasis on shelter requirements, construction, and the production of building materials. UNCHS is also carrying out a pre-feasibility study for a pilot project on district cooling systems based on the use of the waste energy from electric power stations.

23. The World Bank considers new and renewable sources of energy as another supply option which must be evaluated, together with other energy alternatives, on the basis of the same investment criteria. Although the Bank continues to support efforts to develop new and renewable sources of energy, its overall involvement, except in the case of fuelwood, has been reduced. This is because the Bank feels that technologies are often not mature enough to meet its project lending criteria, based on a performance track record of economic and financial viability. Even when a technology is regarded as mature, it is often difficult to design a project of enough critical mass to have an acceptable ratio of staff time to investment cost, and hence to merit consideration as a stand-alone lending activity. Moreover, the Bank considers the institutional and policy framework for the implementation of new and renewable sources of energy projects to be generally weak in many developing countries. In many cases there has been a clear need for intensive pre-investment work rather than investment financing. At present, most of the activities in this field are carried out under the joint World Bank/UNDP Bilateral Aid Energy Sector Management Assistance Programme (ESMAP). New and renewable sources of energy are only one component in ESMAP's broader mandate to assist the developing countries address urgent issues related to overall energy efficiency and overdependence on traditional fuels. However, large hydroelectric projects comprise a major area of lending, and the Bank has provided financing for a number of small hydro projects, including financing by the International Finance Corporation (IFC) for private-sector manufacturing of hydro equipment. Although the Bank's lending for fuelwood/forestry projects is continuing, lending for other biomass technologies and for solar and wind energy has mainly taken the form of the financing of pilot and demonstration activities, included as small components of large energy or agriculture projects.

24. Solar photovoltaic (PV) stand-alone systems (and installation) have been increasingly requested by UNICEF-supported projects in remote rural areas or in areas where other sources of energy are unreliable. Vaccine refrigerators

and, to a lesser degree, water pumps and lighting systems have been the main systems provided. The involvement of UNICEF with these small stand-alone systems extends beyond merely supplying the systems. In cooperation with other agencies - mainly, the World Health Organization (WHO), Governments, non-governmental organizations, manufacturers and specialized consulting firms - UNICEF's experience has extended to all aspects of such projects, such as comparative efficiency with other low-cost energy options, economic viability, design improvement, product testing, performance monitoring and evaluation, and cost analysis. UNICEF country offices have also been involved in activities related to new and renewable sources of energy, such as fuelwood and charcoal and draught animal power, although more modest in size.

25. The World Health Organization (WHO) is promoting multidisciplinary research on the epidemiological aspects of biomass fuel, in recognition of the major health hazards associated with its use, especially for women and children, who are responsible in most societies for the provision of fuel and the cooking of food. WHO is also studying appropriate technical interventions (including alternate energies) and on the social dimensions of the problem.

26. The United Nations University (UNU) continues to develop new approaches to the diffusion of promising renewable energy technologies to rural areas and new ways of integrating energy systems rationally into the fabric of local communities and disseminating information on solar, wind and bioconversion energy technologies, integrated rural energy systems, and the social, cultural, economic, health and environmental aspects of their use.

27. The United Nations Development Programme (UNDP) continues to provide assistance to the developing countries in the field of new and renewable sources of energy through technical cooperation, while ensuring the priorities established by recipient countries. UNDP also continues to be a major source of funding for projects carried out by several entities of the United Nations system and for the regional development programmes.

28. The United Nations Revolving Fund for Natural Resources Exploration remains firmly committed to the promotion and development of geothermal resources in the developing countries.

B. Activities in specific new and renewable sources of energy

29. The activities carried out by the entities of the United Nations system with respect to specific new and renewable sources of energy are shown in table 3. They range from mature and commercially proven technologies such as hydropower and wood-fired steam generation plants to technologies which are still in the early stages of commercial use and research and development, such as photovoltaics or alcohol derived from cellulosic biomass.

30. Table 3 shows clusters of activities by the entities of the United Nations system in technologies such as solar, wind, biomass, fuelwood and charcoal, which are suitable for utilization in a decentralized form in developing countries.

Table 3. Activities of the United Nations system in specific new and renewable sources of energy

Nature of activities and entities of the United Nations involved / Priorities of the Nairobi Programme of Action	Supporting measures: Information exchange, studies, publications, reports to intergovernmental meetings	Supporting measures: Meetings, symposiums, expert groups, seminars, workshops	Technology/resource transfer: Technical cooperation projects/ activities	Technology/resource transfer: Financial assistance/ grants
Solar energy	DIESA, DTCD, ECA, ECE, ECLAC, ESCWA, FAO, UNCHS, UNESCO, UNIDO, UNU	DIESA, DTCD, ECA, ECE, ESCAP, FAO, UNIDO	DTCD, ECE, ESCAP, FAO UNIDO	UNDP, IBRD
Wind	DIESA, DTCD, ECA, ECE, ECLAC, ESCAP, ESCWA, FAO, UNIDO	DTCD, ECA, ECE, ESCAP, FAO, UNIDO	DTCD, ECE, ESCAP, FAO, UNIDO	UNDP, IBRD
Biomass	DIESA, ECA, ECLAC, ESCAP, ESCWA, FAO, UNEP, UNIDO, UNU	ECA, ECE, ESCAP, ESCWA, FAO, UNIDO,	DTCD, ECE, ESCWA, FAO, UNIDO	UNDP, IBRD
Fuelwood and charcoal	DIESA, ECE, ECLAC, ESCAP, ESCWA, FAO, UNEP, UNIDO	ECA, ESCAP, ESCWA, FAO	ESCAP, FAO	UNDP, IBRD
Hydro	DIESA, DTCD, ESCAP	DTCD	DTCD, UNIDO	UNDP, IRRD
Geothermal	DIESA, DTCD, ECA, ECLAC, ESCAP, ESCWA	DTCD	DTCD, UNRFNRE	UNDP, IBRD
Draught animal power	DIESA, ESCAP, FAO	ESCAP, FAO	ESCAP, FAO	UNDP, IRRD
Ocean energy	DIESA, DTCD, ESCAP, ECE, UNDP	DTCD, ESCAP, ECE		
Tar sands and oil shale	DIESA, DTCD, ESCAP, UNDP, UNITAR	DTCD, UNITAR, UNDP		
Peat	DIESA, DTCD			

Source: Reports from the entities of the United Nations system.

31. Activities in solar energy range from active solar energy systems, such as solar drying and cooling of grain in bulk storage, to passive solar energy systems for rural energy supply and urban industry.

32. A significant number of the activities of the United Nations system in wind energy technology in the developing countries are directed towards wind pumps, which have also featured in development aid projects in a number of developing countries.

33. The United Nations system has emphasized the assessment of biomass as an energy resource. Activities include information networks in some countries and regions, with linkages to networks in the industrial countries where information sources and dissemination facilities are considerable.

34. Activities in fuelwood include surveys of its utilization, the dissemination of energy-efficient wood stoves, and expanded efforts for reforestation and tree-planting.

35. A large number of the United Nations programmes in hydropower involves small-scale plants. The activities are mostly directed towards technical training and feasibility studies, including socio-economic impacts. The objective, in general, is for the developing countries to achieve greater self-reliance in the development of their hydropower resources.

36. The United Nations system has played a pioneering role in promoting geothermal energy development in the developing countries and is actively continuing its efforts. However, a large geothermal potential remains untapped, despite favourable geological conditions in a number of developing countries.

37. In ocean energy, there is currently little activity at the country level that goes beyond prototype-testing and feasibility studies for large-scale demonstration. Activities of the United Nations system in this field have been limited to promoting awareness of the different technologies under study, for possible application, especially in small island countries.

38. With regard to draught animal power, activities consist of conferences, meetings and workshops in Africa and Asia and the Pacific for the purpose of exchanging information and experiences.

39. Very limited activities are reported for oil shale, tar sands and peat.

II. ASSESSMENT OF PROGRESS ACHIEVED

40. The entities of the United Nations system continue their efforts to implement the Nairobi Programme of Action, and the activities outlined above represent those efforts. A summary list of the projects and programmes undertaken by the organizations since 1989, and continuing, is presented in table 4.

Table 4. List of projects in new and renewable sources of energy being executed by the entities of the United Nations system since 1989 and continuing

Executing agency	Country	Project title
DTCD	Costa Rica	Energy planning
	China	Solar heating and cooking
	Vietnam	Restoration of power generation capacity
	Pakistan	Demonstration of renewable technologies for rural areas
	Bangladesh	Strengthening the energy study and planning cell in the Planning Commission
	Nepal	Engineering education (hydro)
	China	Exploration, development and utilization of geothermal resources in China
	Kenya	Exploration of geothermal energy, phase II
	Egypt	Development and demonstration of prototypes for renewable sources of energy in selected areas
	Egypt	Electricity/energy databank
	Bolivia	Geothermal feasibility study in the area of Laguna Colorado
	Bangladesh	Strengthening manpower development and training in the Bangladesh Power Development Board
	China	Geothermal district heating in Beijing and Tianjin areas
	Ghana	Technical assistance to National Energy Board
	Honduras	Pre-feasibility study of geothermal resources in the central region
	Regional	Assistance to OLADE "Apoyo al Programa Latinamericano de cooperacion energetica"

Table 4 (continued)

Executing agency	Country	Project title
	Korea, Rep. of	Training for study of energy policy
	India	Solar energy centre
	Afghanistan	Solar energy and other renewable energy development
	Philippines	Management of geothermal resources
	Peru	Polysilicon laboratory
	Philippines	Development of geothermal energy for power and non-electrical uses
	Iraq	Solar energy resources assessment and development
	Ethiopia	Small-scale hydropower development
	Cuba	Silicon laboratory
	Bangladesh	Power system loss-reduction programme
	India	Energy conservation programme
	Peru	Assistance to CENERGIA
	Regional	Assistance to the programme of Latin America and the Caribbean for cooperation in energy - OLADE
	China	Development of photovoltaic systems in western China
	Mongolia	Feasibility studies for development of solar photovoltaic cells
	Mongolia	Applied research and development for rural use of renewable energy
	China	Exploration, development and utilization of geothermal resources in China (phase II in Tibet)
ECE	Regional	Energy-efficient building systems
	Regional	Utilization of low-calorie fuels

Table 4 (continued)

Executing agency	Country	Project title
ESCAP	Regional	Regional energy development programme, phase III
	Regional	Pacific energy development programme, phase II
ESCWA	Regional	Regional consultative meeting for promoting the development of new and renewable sources of energy in the ESCWA region
	Regional	Biogas technology for rural areas in selected Arab countries
FAO	Regional	Development of integrated farm energy systems, II (Europe)
	China	Establishment of integrated energy base for the cold northeastern region of China
	Regional	Rural energy assessment and planning in Asia and the Pacific
	Regional	Regional energy development programme: component on rural energy planning (in association with ESCAP)
FAO	Burkina Faso	Ouagadougou forest development
	Chad	Forest management
	Nepal	Technical assistance to Terai forestry project
	Niger	Research, selection and adaptation of draught animal power equipment
	Burkina Faso	Forest management of national forests
	Malawi	Animal power utilization
	Burkina Faso	Programme for nursery training and tree management for product of fuelwood
	Benin	Mechinisme agricole, Centre national de formation à la culture atelée
	Ghana	Rural energy planning
	Ghana	Energy use in agriculture in Ghana

Table 4 (continued)

Executing agency	Country	Project title
	Ghana	Assessment and use of bio-energy residues and wastes in Ghana
IBRD (as principal agency or in associative arrangements)	Kenya	Kiambere/Cambery hydroelectric power station
	Indonesia	Cirata hydropower project in West Java
	Papua New Guinea	Hydroelectric power project
	Rwanda	Rehabilitation of the power network
	Zaire	SNELL investment programme
	Thailand	Hydropower projects: Cheo Larn
	Guatemala	Power distribution project
	Brazil	Power sector rehabilitation plan
	Guadelope	Biomass gasifier monitoring programme
	Nepal	Pacheshwor and Rapti Indo-Nepalese hydropower projects
	Egypt	Esna barrage power station
	Lesotho	Highlands water project
	Argentina	Alicura II power plant on the Limay river
	Mauritius	National energy programme
	Chile	Pehuenche hydropower station
	Indonesia	Energy conservation centre
	Brazil	Hydroelectric project, Aracuai river
	Thailand	Accelerated dissemination of improved stoves
	Jordan	Wind energy project in Jordan
	Ghana	Improved charcoal production

Table 4 (continued)

Executing agency	Country	Project title
	Ghana	Improved charcoal stove programme targeted at urban households
	Sri Lanka	Mahaweli Ganga fuelwood development programme
	Regional	Energy planning systems (joint Euro-Arab project)
	Malawi	Energy sector planning and management
	Global	ESMAP Phase II: Energy strategy and efficiency/household energy and renewables
	India	Upper Indravati hydro project, Orissa
	Jordan	Power subsector development
	India	Improved hydropower capacity
IDA	Bhutan	Tree nursery development project
	Ethiopia	Fuelwood energy development project
	Ghana	Solar and wind resources assessment
	Lesotho	Sengu River water transport and hydropower station
	Somalia	Animal disease control programme
	Uganda	Forest resources management
UNDP (national pro-grammes)	El Salvador	Photovoltaic modular medical facility for remote areas
	Global	Geothermal Institute of the University of Auckland, New Zealand
	Solomon Islands	National energy sector support and development
	Niger	Pilot project of agro-forestry development in the Department of Dosso
	Haiti	Reforestation in semi-arid zones for fuelwood

Table 4 (continued)

Executing agency	Country	Project title
	Somalia	Forestry development and strengthening of forestry department, II
	Tunisia	Rural appropriate technology centre, II
	Ethiopia	Forestry conservation, II
	Nepal	Appropriate technology and agricultural development
	Philippines	Social forestry
	Benin	Construction of biogas units
	Tunisia	Development of photovoltaic generators, II
	Togo	Hydropower planning
	Tunisia	Biomass study in the rural sector
	Pakistan	Biogas development
UNESCO	Regional	Arab regional information system network (ARIS-NET)
UNIDO	China	Asia-Pacific regional network for small hydropower
	India	Application of alternative fuels for internal combustion engines, II
	Egypt	Conservation in industry
	Madagascar	Research programme
	Paraguay	Development of energy technologies for biomass
	Egypt	Manufacture of wind turbines for electricity production
	Uruguay	Assessment of wind energy
	Uruguay	Biogas production
	Uruguay	Charcoal production and wood gasification
	Uruguay	Potential use of fuelwood/charcoal as fuel in industry

Table 4 (continued)

Executing agency	Country	Project title
	Viet Nam	Development of small hydroelectric plants
	India	Development of amorphous silicon solar cells
	Zimbabwe	Energy auditing training courses
	Gambia	Salt production and marketing in Darsilami village
	Regional	Establishment of energy conservation network - Western Asia
	Regional	Establishment of energy conservation network - Africa
	India	Development and establishment of solar-photovoltaic-powered submersible water pumping systems
UNRFNRE	Mexico	Geothermal exploration project at Planillas, Guadalajara
UNU	Global	Abstracts of selected solar energy technology (ASSET)
	Global	Network of new and renewable energy research institutes
WMO	Regional	Meteorological information for development of renewable energy (Europe)

Source: Department of International Social and Economic Affairs, New and Renewable Sources of Energy Database, 1991.

41. Significant progress has been made in several of the developing countries, where the United Nations system, in a supportive role, has undertaken wide-ranging activities in order to assist the countries in their own efforts. The thrust of the United Nations programmes is directed towards strengthening national institutions, conducting surveys and enhancing national technical capabilities through education and training in the appropriate technologies.

42. Support provided by the United Nations system in national energy assessment and planning has been successful in assisting many countries in determining critical areas of policy and planning.

43. The promotion of human resources development by the United Nations system is carried out mainly by incorporating training and educational activities in the programmes and projects executed by the system. Such activities have also included fellowships, study tours, training workshops and participation in international conferences. Significant progress has been made in promoting education and training through regional training workshops and network activities. An increased awareness of environmental issues in relation to development is reflected in the educational and training activities that are being carried out.

44. In the area of transfer of technology, adaptation and application of mature technologies, owing to the inherent limitations of the processes involved, very few activities are being carried out. The entities of the system have promoted technology transfer by organizing exhibitions and seminars and assisting in the preparation of joint venture proposals. There is a significant lack of support for activities which contribute to technology transfer and which involve the adaptation and application of mature technologies. However, in those developing countries with an established local research and development base and with national and private-sector promotional measures, technology has been transferred, having absorbed modern renewable energy technologies and adapted them to local conditions.

45. In the area of information flows, the activities of certain United Nations agencies have led to the linkage of existing information systems, services and sources of the system. Databases have been interconnected, the involvement of non-governmental organizations has been enhanced, and uniform formats for information compilation, which have led to improved access to information generated in both developing and industrialized countries, have been designed. The United Nations entities concerned continue to provide assistance in various activities related to information-gathering, including document acquisition. Nevertheless, information flows need to be further developed and expanded in the areas identified in the Nairobi Programme of Action.

46. In the area of rural energy supplies, significant progress has been achieved through integrated rural energy development programmes. Many activities have been undertaken on various aspects of rural energy. They focus attention on the need for integrated planning, emphasizing the role of new and renewable sources of energy in a wide range of applications - agricultural production, post-harvest needs, domestic needs, water-lifting etc. - using draught animal power, wood, solar and wind energy, biogas, and efficient cooking stoves, among others. Planning studies and pilot integrated rural energy projects have been undertaken in a number of developing countries.

III. CONCLUSIONS

47. Considerable progress has been achieved by the entities within the United Nations system, despite the limited resources available, in the implementation of the Nairobi Programme of Action. They have undertaken and continue to undertake numerous activities in the promotion of the development and use of new and renewable energy technologies in the developing countries. Any expansion of activities will depend largely on the availability of resources, which continue to be limited and which may in fact have declined in real terms.

Notes

1/ Official Records of the General Assembly, Forty-fifth session, Supplement No. 36 (A/45/36).

2/ Report of the United Nations Conference on New and Renewable Sources of Energy, Nairobi, 10-21 August 1981, (United Nations publication, Sales No. E.81.I.24).

Annex

LIST OF ABBREVIATIONS

DIESA	Department of International Economic and Social Affairs, United Nations Secretariat
DTCD	Department of Technical Cooperation for Development, United Nations Secretariat
ECA	Economic Commission for Africa
ECE	Economic Commission for Europe
ECLAC	Economic Commission for Latin America and the Caribbean
ESCAP	Economic and Social Commission for Asia and the Pacific
ESCWA	Economic and Social Commission for Western Asia
UNICEF	United Nations Childrens Fund
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNITAR	United Nations Institute for Training and Research
UNRFNRE	United Nations Revolving Fund for Natural Resources Exploration
UNU	United Nations University
UNCHS	United Nations Centre for Human Settlements
INSTRAW	International Research and Training Institute for the Advancement of Women
FAO	Food and Agriculture Organization of the United Nations
WHO	World Health Organization
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association (World Bank)
WMO	World Meteorological Organization
IFAD	International Fund for Agricultural Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization